

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of :

M. Nakashima et al.

Group Art Unit: To Be Assigned

Serial No.: Division of 09/129,950

Examiner: To Be Assigned

Filed: June 25, 2001

For: HIGH MOLECULAR WEIGHT SILICONE COMPOUNDS, RESIST
COMPOSITIONS, AND PATTERNING METHOD

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

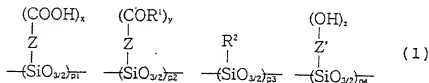
Sir:

Prior to initial examination, please amend the above-identified application as indicated below and consider the remarks which follow:

IN THE CLAIMS:

Please cancel claims 1 and 6-15 without prejudice or disclaimer.

2. (Amended) A high molecular weight silicone compound comprising recurring units represented by formula (1), said silicone compound having a weight average molecular weight of 1,000 to 50,000,



KOJIM-245 D1

wherein Z is a divalent to hexavalent, non-aromatic, monocyclic or polycyclic hydrocarbon or bridged cyclic hydrocarbon group having 5 to 12 carbon atoms; Z' is a divalent to hexavalent, normal or branched hydrocarbon group having 1 to 20 carbon atoms or non-aromatic, monocyclic or polycyclic hydrocarbon or bridged cyclic hydrocarbon group having 3 to 20 carbon atoms; Z or Z' may have a nitrogen, oxygen or sulfur atom interposed in a carbon-to-carbon bond, the hydrogen atom on a carbon atom may be replaced by a halogen, alkoxy, nitro, cyano or acetyl group, and a methylene group in the carbon skeleton may be replaced by a carbonyl group;

x, y and z are independently integers of 1 to 5
corresponding to the valence of Z and Z';

R¹ is a group represented by formula (2a) or (2b); R² is a normal, branched or cyclic, substituted or unsubstituted, alkyl group having 1 to 8 carbon atoms or alkenyl group having 3 to 8 carbon atoms or a monovalent, non-aromatic, polycyclic hydrocarbon or bridged cyclic hydrocarbon group having 5 to 12 carbon atoms;



wherein R is hydrogen, hydroxyl group or a normal, branched or cyclic alkyl group having 1 to 20 carbon atoms, R' is a normal, branched or cyclic alkenylene group having 1 to 20 carbon atoms, an alkyl R or an alkylene R' group may have an oxygen atom interposed in a carbon-to-carbon bond, some of the hydrogen atoms attached to carbon atoms may be replaced by hydroxyl groups; or R and R', taken together, may form a ring, and each of R and R' is a normal or branched alkylene group of 1 to 8 carbon atoms when they form a ring; and

p1 is a positive number and p2, p3 and p4 are 0 or positive numbers and satisfy:

$$p1+p2+p3+p4 = 1,$$

$$0 < p1/(p1+p2+p3+p4) \leq 0.9,$$

$$0 \leq p2/(p1+p2+p3+p4) \leq 0.8,$$

$$0 \leq p3/(p1+p2+p3+p4) \leq 0.7,$$

$$0 \leq p4/(p1+p2+p3+p4) \leq 0.9,$$

wherein some or all of the hydrogen atoms of carboxyl groups or carboxyl groups and hydroxyl groups in silicone compound of formula (1) are replaced by at least one acid labile group, said silicone compound having a weight average molecular weight of 1,000 to 50,000.

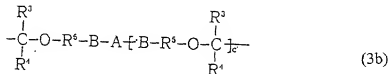
3. (Amended) The high molecular weight silicone compound of claim 2 wherein the acid labile group is at least one group selected from the class consisting of formula (4), formula (5), tertiary alkyl groups of 4 to 20 carbon atoms, trialkylsilyl groups whose alkyl groups each have 1 to 6 carbon atoms, and oxoalkyl groups of 4 to 20 carbon atoms,



wherein R⁶ and R⁷ each are independently hydrogen or a normal, branched or cyclic alkyl group of 1 to 18 carbon atoms, R⁸ is a monovalent hydrocarbon group of 1 to 18 carbon atoms which may have a hetero atom, or R⁶ and R⁷, R⁶ and R⁸, or R⁷ and R⁸, taken together, may form a ring, and R⁶, R⁷ and R⁸ each are independently a normal or branched alkylene group of 1 to 18 carbon

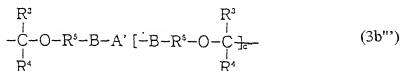
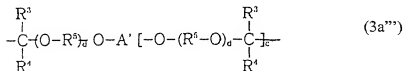
atoms when they form a ring, R^9 is a tertiary alkyl group of 4 to 20 carbon atoms, a trialkylsilyl group whose alkyl groups each have 1 to 6 carbon atoms, an oxoalkyl group of 4 to 20 carbon atoms or a group of formula (4), and letter a is an integer of 0 to 6.

4. (Amended) The high molecular weight silicone compound of claim 2 wherein some of the hydrogen atoms of carboxyl groups or carboxyl groups and hydroxyl groups in said silicone compound are replaced by at least one acid labile group, and 0 mol% to 50 mol% of the hydrogen atoms of the carboxyl groups and/or hydroxyl groups are replaced by crosslinking groups having C-O-C linkages represented by formula (3a) or (3b) whereby the silicone compound is crosslinked within a molecule and/or between molecules,



wherein each of R^3 and R^4 is independently hydrogen or a normal, branched or cyclic alkyl group of 1 to 8 carbon atoms, or R^3 and R^4 , taken together, may form a ring, and each of R^3 and R^4 is independently a normal or branched alkylene group of 1 to 8 carbon atoms when they form a ring, R^5 is a normal, branched or cyclic alkylene group of 1 to 10 carbon atoms, d is 0 or an integer of 1 to 10, A is a c-valent aliphatic or alicyclic saturated hydrocarbon group, aromatic hydrocarbon group or heterocyclic group of 1 to 50 carbon atoms, which may have an intervening hetero atom and in which the hydrogen atom attached to a carbon atom may be partially replaced by a hydroxyl group, carboxyl group, acyl group or fluorine atom, B is $-CO-O-$, $-NHCO-O-$ or $-NHCONH-$, c is an integer of 2 to 8, and c' is an integer of 1 to 7.

5. (Amended) The high molecular weight silicone compound of claim 4 wherein the crosslinking group having C-O-C linkages represented by formula (3a) or (3b) is represented by the formula (3a''') or (3b'''):



wherein each of R³ and R⁴ is independently hydrogen or a normal, branched or cyclic alkyl group of 1 to 8 carbon atoms, or R³ and R⁴, taken together, may form a ring, and each of R³ and R⁴ is independently a normal or branched alkylene group of 1 to 8 carbon atoms when they form a ring, R⁵ is a normal, branched or cyclic alkylene group of 1 to 10 carbon atoms, d is 0 or an integer of 1 to 5, A' is a c"-valent normal, branched or cyclic alkylene, alkyltriyl or alkyltetrayl group of 1 to 20 carbon atoms or arylene group of 6 to 30 carbon atoms, which may have an intervening hetero atom and in which the hydrogen atom attached to a carbon atom may be partially replaced by a hydroxyl group, carboxyl group, acyl group or fluorine atom, B is -CO-O-, -NHCO-O- or -NHCONH-, c" is an integer of 2 to 4, and c''' is an integer of 1 to 3.

Please add the following new claims 16-21.

16. A resist composition comprising

(A) an organic solvent,

(B) a base resin in the form of the high molecular weight silicone compound of claim 3, and

(C) a photoacid generator.

17. A resist composition comprising

(A) an organic solvent,

(B) a base resin in the form of the high molecular weight silicone compound of claim 5, and

(C) a photoacid generator.

18. The resist composition of claim 4 further comprising (D) a dissolution inhibitor.

19. The resist composition of claim 4 further comprising (E) a basic compound.

20. The resist composition of claim 4 further comprising (F) a compound having a group represented by $\equiv\text{C}-\text{COOH}$ in a molecule.

21. The resist composition of claim 4 further comprising (G) an acetylene alcohol derivative. --

REMARKS

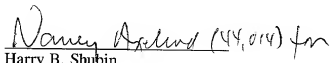
Claims 1 and 6-15 (as well as claims 16-27, which were added during prosecution) were allowed in the parent application, 09/129,950, and have been canceled in the present application. The remaining claims, claims 2-5, were subject to a restriction requirement in the parent and are presently under consideration herein.

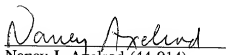
Applicants note that claims 2-3 (restricted into Group II in the parent application, and

of claim 4 requires the particulars of the compound of claim 2. Therefore, the groups are not restrictable. MPEP 806.05(c)

Therefore, it is believed that the present claims are condition for allowance, which action is respectfully requested.

Respectfully submitted,

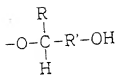

Harry B. Shubin
Registration No. 32,004
Attorney for Applicants


Nancy J. Axelrod (44,014)
Patent Agent

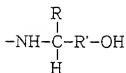
MILLEN, WHITE, ZELANO & BRANIGAN, P. C.
2200 Clarendon Boulevard, Suite 1400
Arlington, Virginia 22201
(703)812-5304
Internet address: axelrod@mwzb.com

Filed: June 25, 2001

K:\kojim\245D1\Preliminary Amendment.doc



(2a)



(2b)

wherein R is hydrogen, hydroxyl group or a normal, branched or cyclic alkyl group having 1 to 20 carbon atoms, R' is a normal, branched or cyclic alkenylene group having 1 to 20 carbon atoms, an alkyl R or an alkenylene R' group may have an oxygen atom interposed in a carbon-to-carbon bond, some of the hydrogen atoms attached to carbon atoms may be replaced by hydroxyl groups; or R and R', taken together, may form a ring, and each of R and R' is a normal or branched alkenylene group of 1 to 8 carbon atoms when they form a ring; and

p1 is a positive number and p2, p3 and p4 are 0 or positive numbers and satisfy:

$$p1+p2+p3+p4 = 1,$$

$$0 < p1/(p1+p2+p3+p4) \leq 0.9,$$

$$0 \leq p2/(p1+p2+p3+p4) \leq 0.8,$$

$$0 \leq p3/(p1+p2+p3+p4) \leq 0.7,$$

$$0 \leq p4/(p1+p2+p3+p4) \leq 0.9,$$

wherein some or all of the hydrogen atoms of carboxyl groups or carboxyl groups and hydroxyl groups in silicone compound of formula (1) are replaced by acid labile groups of at least one acid labile type group.

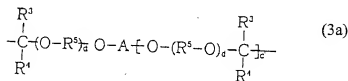
said silicone compound having a weight average molecular weight of 1,000 to 50,000.

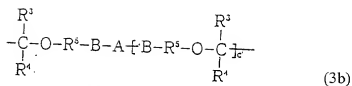
3. (Amended) The high molecular weight silicone compound of claim 2 wherein the acid labile group is at least one group selected from the class consisting of groups of the following general formula (4), groups of the following general formula (5), tertiary alkyl groups of 4 to 20 carbon atoms, trialkylsilyl groups whose alkyl groups each have 1 to 6 carbon atoms, and oxoalkyl groups of 4 to 20 carbon atoms,



wherein R⁶ and R⁷ each are independently hydrogen or a normal, branched or cyclic alkyl group of 1 to 18 carbon atoms, R⁸ is a monovalent hydrocarbon group of 1 to 18 carbon atoms which may have a hetero atom, or R⁶ and R⁷, R⁶ and R⁸, or R⁷ and R⁸, taken together, may form a ring, and R⁶, R⁷ and R⁸ each are independently a normal or branched alkylene group of 1 to 18 carbon atoms when they form a ring, R⁹ is a tertiary alkyl group of 4 to 20 carbon atoms, a trialkylsilyl group whose alkyl groups each have 1 to 6 carbon atoms, an oxoalkyl group of 4 to 20 carbon atoms or a group of ~~the above general~~ formula (4), and letter a is an integer of 0 to 6.

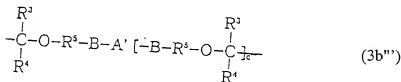
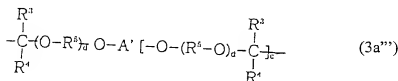
4. (Amended) The high molecular weight silicone compound of claim 2 wherein some of the hydrogen atoms of carboxyl groups or carboxyl groups and hydroxyl groups in said silicone compound are replaced by ~~acid labile groups of~~ at least one acid labile group type, and ~~more than~~ 0 mol% to 50 mol% of the hydrogen atoms of the carboxyl groups and/or hydroxyl groups are replaced by crosslinking groups having C-O-C linkages represented by ~~the following general~~ formula (3a) or (3b) whereby the silicone compound is crosslinked within a molecule and/or between molecules,





wherein each of R³ and R⁴ is independently hydrogen or a normal, branched or cyclic alkyl group of 1 to 8 carbon atoms, or R³ and R⁴, taken together, may form a ring, and each of R³ and R⁴ is independently a normal or branched alkylene group of 1 to 8 carbon atoms when they form a ring, R⁵ is a normal, branched or cyclic alkylene group of 1 to 10 carbon atoms, letter d is 0 or an integer of 1 to 10, A is a c-valent aliphatic or alicyclic saturated hydrocarbon group, aromatic hydrocarbon group or heterocyclic group of 1 to 50 carbon atoms, which may have an intervening hetero atom and in which the hydrogen atom attached to a carbon atom may be partially replaced by a hydroxyl group, carboxyl group, acyl group or fluorine atom, B is -CO-O-, -NHCO-O- or -NHCONH-, letter c is an integer of 2 to 8, and c' is an integer of 1 to 7.

5. (Amended) The high molecular weight silicone compound of claim 4 wherein the crosslinking group having C-O-C linkages represented by the ~~general~~ formula (3a) or (3b) is represented by the ~~following general~~ formula (3a'') or (3b''):



wherein each of R³ and R⁴ is independently hydrogen or a normal, branched or cyclic alkyl group of 1 to 8 carbon atoms, or R³ and R⁴, taken together, may form a ring, and each of R³ and R⁴ is independently a normal or branched alkylene group of 1 to 8 carbon atoms when they form a

ring, R⁵ is a normal, branched or cyclic alkylene group of 1 to 10 carbon atoms, ~~letter~~ d is 0 or an integer of 1 to 5, A' is a c"-valent normal, branched or cyclic alkylene, alkyltriyyl or alkyltetrayl group of 1 to 20 carbon atoms or arylene group of 6 to 30 carbon atoms, which may have an intervening hetero atom and in which the hydrogen atom attached to a carbon atom may be partially replaced by a hydroxyl group, carboxyl group, acyl group or fluorine atom, B is -CO-O-, -NHCO-O- or -NHCONH-, ~~letter~~ c" is an integer of 2 to 4, and c'" is an integer of 1 to 3.

Since claims 16-21 are newly added, no marked-up version is necessary.

0987320-062501